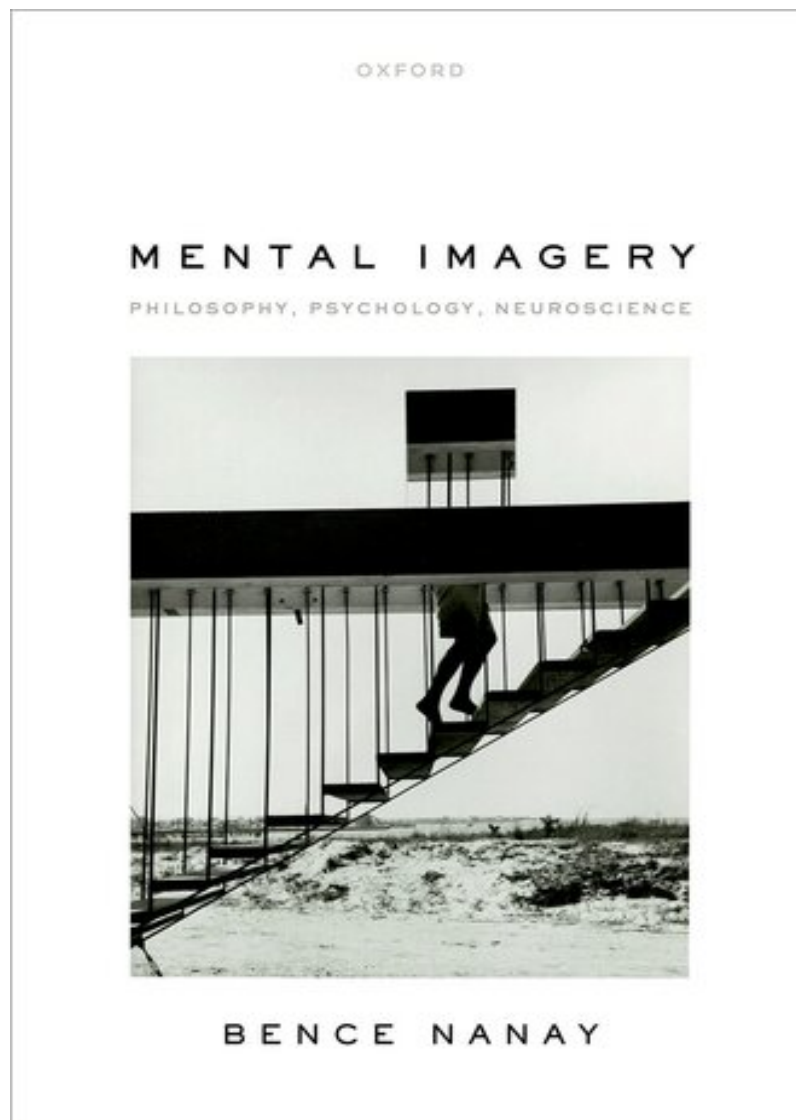


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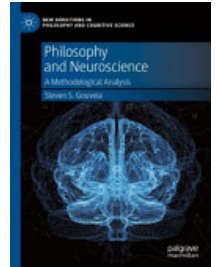


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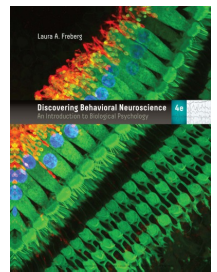
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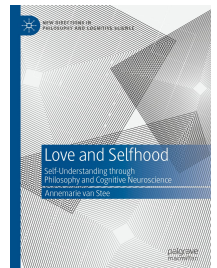
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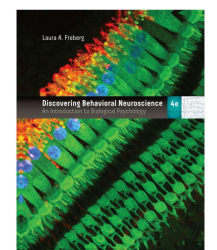
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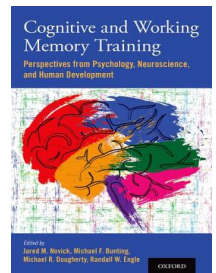
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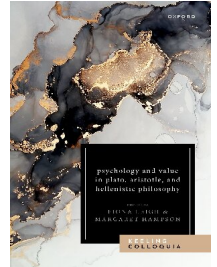
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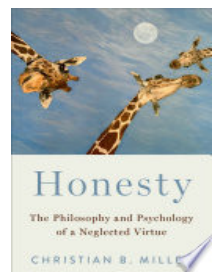
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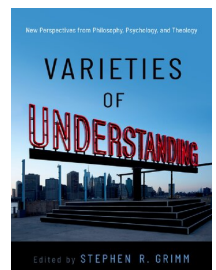
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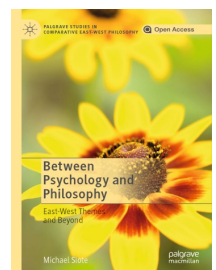
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Foreword

Here is a story the French photographer Henri Cartier-Bresson liked to tell: during the Second World War, he was hiding in a shed in the middle of the nondescript German countryside surrounded by a mountain range. He spent weeks there, fearing for his life. Then one day he visualized the ocean behind the mountain range. And this completely transformed his experience. Not only his experience of the mountain range, but also of his general situation and of himself.¹ Mental imagery does have a huge influence on the way we perceive, and on our mental life in general.

This book is about mental imagery and the important work it does in our mental life. It plays a crucial role in the vast majority of our perceptual episodes. It also helps us understand many of the most puzzling features of perception (like the way it is influenced in a top-down manner and the way different sense modalities interact). But mental imagery also plays a very important role in emotions, action execution, and even in our desires. In sum, there are very few mental phenomena that mental imagery doesn't show up in—in some way or other. The hope is that if we understand what mental imagery is, how it works and how it is related to other mental phenomena, we can make real progress on a number of important questions about the mind.

I wrote this book for an interdisciplinary audience. As it aims to combine philosophy, psychology, and neuroscience to understand mental imagery, I have not presupposed any prior knowledge in any of these disciplines. As a result, readers with no background in any of these disciplines can also follow the arguments.

The book has many short chapters, organized into five parts. Part I is about mental imagery, whereas the rest of the book is about the role it plays in perception (Part II), multimodal perception (Part III), cognition (Part IV), and action (Part V). The chapters are (almost) all self-standing, so the reader can jump around freely, but it probably makes sense to read Part I first.

A lot has been written about imagination in the philosophy of mind and beyond. Mental imagery is a much more basic (and also conceptually less problematic) concept than imagination. Nonetheless, much less attention has been devoted to mental imagery. The aim of this book is to fill this gap and put mental imagery at the forefront of our thinking about the mind.

David Hume memorably said that “the memory, senses, and understanding are, [...], all of them founded on the imagination.”² My aim is to convince the reader that “the memory, senses, and understanding are, all of them founded” on mental imagery.

I started working on the topic of mental imagery in the Fall of 2006, when, fresh out of PhD, I gave my first graduate seminar at Syracuse University. And mental imagery has been the primary focus of my research in the last eight years or so. As a result, it is difficult to enumerate all those who helped me to think through these issues and also the venues where I presented the material of the book, but I’ll try it anyway.

I gave talks that were directly related to mental imagery at various conferences of the American Philosophical Association (one Eastern, one Pacific, two Central) as well as the University of Manchester, the University of British Columbia, Simon Fraser University, University of Geneva, various conferences of the American Society of Aesthetics, University of Cardiff, University of Sheffield (twice), University of Porto, University of Warwick, various conferences and talks at Ruhr Universität Bochum, University of Bergen, Berlin School of Mind and Brain (twice), various conferences of the Association of the Scientific Study of Consciousness, University of Leeds, Institut Jean Nicod, Courtauld Institute, University of East Anglia, University of Urbino, University of Milan (twice), University of

Exeter, University of Oslo, Barnard College, University of Salzburg (twice), University of Aix/Marseilles, Oxford University (twice), Southern Society of Philosophy and Psychology, University of North Carolina, Chapel Hill, Hebrew University, Jerusalem, Kirschberg Symposium, University of Southampton, University of Nijmegen, University of Toronto, University of Ghent, University of Torino, NYU Abu Dhabi, Bilkent University, various online talks during the COVID-19 pandemic, Washington University, Saint Louis, University of Kent, Humboldt Universität, Berlin, University of Kraków, University of Bristol, City University of New York, Università Svizzera Italiana, LMU Munich, University of Lisbon.

Some versions of the arguments I presented in this book were published in the following journals: *Philosophical Transactions of the Royal Society B*, *Cognition*, *Cortex*, *Philosophical Studies*, *Pacific Philosophical Quarterly*, *Analysis*, *Journal of the American Society of Aesthetics*, *Ergo*, *Synthese*, *Multisensory Research*, *Thought*, *Perception*, *i-Perception*, *Consciousness and Cognition*, *The Monist*, *Frontiers in Psychology*, *Mind & Language*, *Journal of Consciousness Studies*, as well as in various edited volumes.

There is no way I can enumerate everyone who gave excellent feedback to some of the material in this book, but I am especially grateful to those who read and commented on either the entire book or almost the entire book: Dustin Stokes, Neil Van Leeuwen, Jake Quilty-Dunn, Robert Briscoe, Dominic Gregory, Amy Kind, Peter Langland-Hassan, Santiago Echeverri, Geraldo Viera, Alma Barner, Adam Bradley, Bras Saad, Laura Silva, Jason Leddington, Nicolas Porot, Peter Fazekas, Carlota Serrahima, Brandon Ashby, Sarah Arnaud, Kris Goffin, Francesco Marchi, Stephen Gadsby, Alex Kerr, Oli Odoffin, Amanda Evans, Anna Ichino, Alex Geddes, Lu Teng, Manolo Martinez, Denis Buehler, Anya Farennikova, Jonathan Cohen, Mohan Matthen, Thomas Raleigh, Kevin Lande, Nick Wiltsher, Chris McCarroll, Dan Williams, Margot Strohminger, Craig French, Maarten Steenhagen, Patrick Butlin, Jacob Berger, Dan Cavedon-Taylor, Chiara Brozzo, Laura Gow, Andrea Blomkvist, Julian Bacharach, Jeremy

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Pober, Andrea Rivadulla, Grace Helton, as well as an anonymous referee for Oxford University Press.

Finally, I am grateful to the team at Oxford University Press, especially Peter Momtschiloff, Jo Spillane, Jen Hinchliffe, and to Andrea Blomkvist for supplying the index. The work on this book was supported by the ERC Consolidator grant [726251], the FWF-FWO grant [G0E0218N], the FNS-FWO grant [G025222N] and the FWO research grant [G0C7416N].

¹ I heard the story from Marine Franck, Cartier-Bresson's widow in 2004 in Locarno.

² Hume: *Treatise of Human Nature* 1.4.7.3–4. I want to leave open the possibility that what Hume meant by "imagination" is in fact closer to what I mean by "mental imagery."

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PART I

MENTAL IMAGERY

1

Mental Imagery in Psychology and Neuroscience

Close your eyes and visualize an apple. Got it? This is an example of mental imagery. It would be tempting to use this example to anchor the reader's intuitive understanding of mental imagery instead of spending some time trying to figure out how we should understand mental imagery. William James famously started his discussion of attention with the sentence: "Everyone knows what attention is" ([James 1890](#), p. 403). So it would be tempting to start this book by saying that "Everyone knows what mental imagery is" and just leave it at that.

This strategy would be extremely problematic for a number of reasons. The most important of these is that there are very significant and well-documented differences between individuals when it comes to mental imagery: some people do not experience mental imagery at all—I will say a lot more about the philosophical significance of this in [Chapter 3](#). Some others have very vivid mental imagery. So trusting that we all know intuitively what mental imagery is, is just lazy.

"Mental imagery" is a technical term. The concept of mental imagery was first consistently used in the, then very new, discipline of empirical psychology at the end of the nineteenth century by psychologists like Francis Galton, Wilhelm Wundt, or Edward Titchener ([Galton 1880](#); [Titchener 1909](#); [Wundt 1912](#)).

Technical terms are supposed to be used in a way that maximizes theoretical usefulness. In this case, theoretical usefulness means that we should use “mental imagery” in a way that would help us to explain how the mind works. My aim is to use a vast amount of empirical data in order to understand age-old and deep philosophical issues. But in order to do so, we need to start with the empirical sciences. So how do the empirical sciences of the mind use the concept of mental imagery?

My starting point is the definition used in a review article on mental imagery in the leading journal *Trends in Cognitive Sciences*: “We use the term ‘mental imagery’ to refer to representations [...] of sensory information without a direct external stimulus” (Pearson et al. 2015, p. 590).¹ This definition aims to capture how the concept of mental imagery is used in a number of empirical disciplines, including psychiatry, neuroscience, and psychology. It is also consistent with some famous characterizations of mental imagery; for example, the one by the all-star team of Stephen Kosslyn, Marlene Behrmann, and Marc Jeannerod, who write that:

Visual mental imagery is “seeing” in the absence of the appropriate immediate sensory input, auditory mental imagery is “hearing” in the absence of the immediate sensory input, and so on. Imagery is distinct from perception, which is the registration of physically present stimuli.

(Kosslyn et al. 1995a, p. 1335)

It is not entirely clear what those scare-quotes mean around the word “seeing” and “hearing” (we’ll come to that). But one thing to note already is that mental imagery, in spite of the connotations of the word “image,” is not necessarily visual: mental imagery can be auditory, olfactory, and tactile as well: it can happen in all sense modalities, not just in vision.

Another influential, albeit somewhat picturesque, characterization of mental imagery comes from the pioneer of mental imagery research, Roger Shepard:

The relation of a mental image to its corresponding object is in some ways analogous to the relation of a lock to a key. [...] the lock can be externally

operated only by its corresponding key [...] It may also be possible to operate the lock, at least partially, by direct manipulation of its mechanism from the inside, in the absence of its external key. (Shepard 1978, p. 130)

I am not entirely sure how much experience Shepard had with locks (as picking a lock would also involve external intervention), but the spirit of this characterization is clear: mental imagery lacks external input. I will follow the usage of the concept of mental imagery in the empirical sciences and define mental imagery as *perceptual representation that is not directly triggered by sensory input*.² This definition needs some unpacking.

By sensory input or sensory stimulation I mean the activation of the sense organ by external stimuli. Sensory stimulation is an event. So, in the visual sense modality, sensory stimulation amounts to the light hitting the receptors in the retina. Some perceptual processing starts with sensory stimulation. But not all. Some perceptual processing is not directly triggered by sensory stimulation.

By triggering a perceptual representation, I mean a simple causal process: our perceptual system can get activated by the event of sensory stimulation (for example, by the light hitting our retina). But it can also get activated in the absence of sensory stimulation. It needs to be emphasized that even on those occasions when it is sensory stimulation that directly triggers perceptual representations, the sensory input gets elaborated and embellished in the course of this perceptual processing—but what triggers this processing and what gets elaborated and embellished is the sensory stimulation. In the case of mental imagery, this perceptual processing (already very early cortical processing, see, for example, Slotnick et al. 2005) is not directly triggered by sensory stimulation, so whatever gets elaborated and embellished is not the sensory stimulation.

By perceptual representation, I mean a representation in the perceptual system. Some of our perceptual representations are triggered directly by sensory input—this amounts to perception, or, as I will say, to “sensory stimulation-driven perception.” And some others are not triggered directly by sensory input—this amounts to mental imagery. Note that I am making a distinction between

perception and perceptual representation. Perceptual representation is representation involved in perceptual processing, which is just processing in the perceptual system. Perceptual representations get activated when we perceive. But they also get activated when we have mental imagery. Perceptual representation that is triggered directly by sensory input is sensory stimulation-driven perception. Perceptual representation that is not triggered directly by sensory input is mental imagery.

I characterized, and will continue to characterize, mental imagery as perceptual representation not directly triggered by sensory input. But some may complain that, strictly speaking, representations are not the kind of things that get to be triggered by sensory input. Perceptual processing is the kind of thing that may or may not be triggered by sensory input. And perceptual representation is the representation used in perceptual processing. I am perfectly happy with this way of formulating mental imagery as perceptual representation that is used in perceptual processing that is not directly triggered by sensory input. But for the sake of simplicity, I will continue to talk about perceptual representations not directly triggered by sensory input. I also think that my characterization of mental imagery is equivalent to saying that mental imagery is perceptual processing not directly triggered by sensory input, as long as we take this perceptual processing to be representational processing. I will use these two ways of characterizing mental imagery (perceptual representation not directly triggered by sensory input and perceptual processing not directly triggered by sensory input) interchangeably, as the perceptual representation in question is the representation used in perceptual processing and as the perceptual processing is representational. Either way, these perceptual representations that are not directly triggered by sensory input are bona fide representations that higher-level processes (perceptual and non-perceptual ones) can use and process further. I will say more about the kind of representations that constitute mental imagery in [Chapter 6](#).

But defining perceptual representation in terms of perceptual processing, and defining perceptual processing in terms of the perceptual system, leaves open how we should think about the perceptual system. Some parts of the processing of sensory stimulation are more clearly perceptual than others. Take the visual sense modality as an example—I will use mainly visual examples in the next couple of chapters before turning to the importance of the complex interaction between the sense modalities. In humans and nonhuman primates, the main visual pathway connects neural networks in the retina to the primary visual cortex (V1) via the lateral geniculate nucleus (LGN) in the thalamus; outputs from V1 activate other parts of the visual cortex and are also fed forward to a range of extrastriate areas (like the secondary visual cortex (V2), V4/V8, V5/middle temporal area (MT), and so on) ([Bullier 2004](#); [Grill-Spector and Malach 2004](#); [Van Essen 2004](#); [Katzner and Weigelt 2013](#)).

While there may be some debates about whether some later stages of this line of processing would count as perceptual, we can safely assume that early cortical processing (that is, the earliest stages of processing following the input) counts as perceptual processing.³ Throughout the book, I will take early cortical processing as sufficient for perceptual processing and most of the examples I will talk about involve early cortical processing. But I want to leave open the possibility that non-early perceptual processing that is not directly triggered by sensory input would also count as mental imagery.

Finally, the concept of directness in my definition of mental imagery may need some further clarification (and the same goes for the concept of “appropriate immediate sensory input” (Kosslyn et al. 1995a, p. 1335; see also [Shepard and Metzler 1971](#)) that has also been used to specify what mental imagery lacks). The perceptual processing is triggered *directly* by sensory input if it is triggered without the mediation of representations involved in some top-down or lateral (perceptual or extra-perceptual) processes.

If the perceptual representation is triggered by something non-perceptual (as in the case of closing our eyes and visualizing), it is not triggered directly by the sensory input.

If the perceptual representation in the visual sense modality is triggered by sensory input in the auditory sense modality (as in the case of the involuntary visual imagery of your face when I hear your voice on the phone with my eyes closed), the visual processing is triggered indirectly. It is triggered with the mediation of some kind of auditory representation—I will call this form of mental imagery “multimodal mental imagery,” see [Chapter 13](#). A direct trigger here would be visual input, but there is no visual input in this case. The auditory input leads to an auditory representation and this auditory representation laterally triggers the visual representation. This process is mediated by the auditory representation. Hence, it is not direct. It counts as mental imagery.

And if the visual representation of the center of the visual field is triggered by input in the periphery of the visual field (say, because the center of the visual field is occluded by an empty white piece of paper), then the visual processing at the center of the visual field is, again, triggered indirectly, that is, in a way mediated by the visual representation in the periphery (see [Chapter 8](#)). A direct trigger would have to be sensory input at the center of the visual field, but there is no such direct trigger in this case. The visual input in the periphery leads to the visual representation of the contours in the periphery. These visual representations trigger, laterally, the visual representation of the contours at the middle of the visual field. This process is mediated by the visual representation in the periphery. Hence, it is not direct. It counts as mental imagery.

All these three different examples of perceptual processing count as mental imagery as the perceptual processing is not triggered directly by the sensory input. Thus, all of these count as mental imagery.

The directness or indirectness of the causal link between sensory input and perceptual processing plays a crucial role in the definition of mental imagery, so here is a quick and dirty way of keeping direct

and indirect causal links apart in this context. In all sense modalities, we have a fairly clear idea of the hierarchy of processing. We have seen that, for example in the visual sense modality, information from the retina is processed in the lateral geniculate nucleus, then in the primary visual cortex (V1), the secondary visual cortex (V2), and then V4/V8, V5/MT. If the processing of a feature in, say, the primary visual cortex is triggered in an entirely bottom-up manner, this is not mental imagery. If it is triggered in a top-down manner or laterally, it is mental imagery. Lateral triggering can happen from a different sense modality (say, audition) or from the same sense modality (when the V1 processing of a feature at the middle of the visual field is triggered by the V1 processing of other features on the left- and right-hand side of the visual field). It is important that while we get mental imagery when the perceptual processing is triggered laterally this way, we do not get mental imagery if the perceptual processing of the input is merely influenced or modified laterally as in this case, the perceptual processing is still directly triggered by the sensory input.

We can also get mixed perception/imagery cases. For example, if seeing the purple paper makes me visualize a purple dinosaur, this perceptual representation may be directly triggered by the sensory input with respect to color, but not in any other respects. In this case, we see the color purple, but have mental imagery of the dinosaur. As we shall see in [Chapter 9](#), these mixed cases are very important in everyday perception.

In some of my earlier writings on mental imagery, I characterized mental imagery as perceptual processing not triggered by corresponding sensory input. While there is an obvious difference between these two ways of thinking about mental imagery (in one it is the lack of directness, in the other it is the lack of correspondence that sets mental imagery apart), I take the two definitions to be co-extensive for the vast majority of cases. The official definition of perceptual representation not directly triggered by sensory input is more general and that is why I am sticking with it, but thinking of mental imagery as perceptual representation that lacks

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country," on account of the absence of running water, abounds in lake basins of this kind. To the south of the Gulf of Arta, which may not inaptly be described as a sort of lake communicating with the sea through a narrow opening, there are several sheets of water, the remains of an inland sea, silted up by the alluvial deposits of the Achelous. The largest of these lakes is known to the natives as Pelagos, or "big sea," because of its extent and the agitated state of its waters, which break against its coasts. This is the Trichonius of the ancient Ætolians. Reputed unfathomable, it is, in truth, very deep, and its waters are perfectly pure; but they are discharged sluggishly into another basin far less extensive, and surrounded by pestilential marshes, and through a turgid stream they even find their way into the Achelous. The hills surrounding Lake Trichonis are covered with villages and fields, whilst the locality around the lower lake has been depopulated by fever. The country, nevertheless, is exceedingly beautiful to look upon. Hardly have we passed through a narrow gorge, or *klisura*, of Mount Zygos before we enter upon a bridge over a mile in length, which a Turkish governor caused to be thrown across the swamps separating the two lakes. This viaduct has sunk down more than half its {49} height into the mud, but it is still sufficiently elevated to enable the eye freely to sweep over the surface of the waters, and to trace the coasts which bound them. Oaks, planes, and wild olive-trees intermingle beneath us, their branches hung with festoons of wild vine, and these, with the blue waters of the lake and the mountains rising beyond it, form a picture of great beauty.

Fig. 12.—LOWER ACARNANIA.
Scale 1 : 800,000.

[M](#)

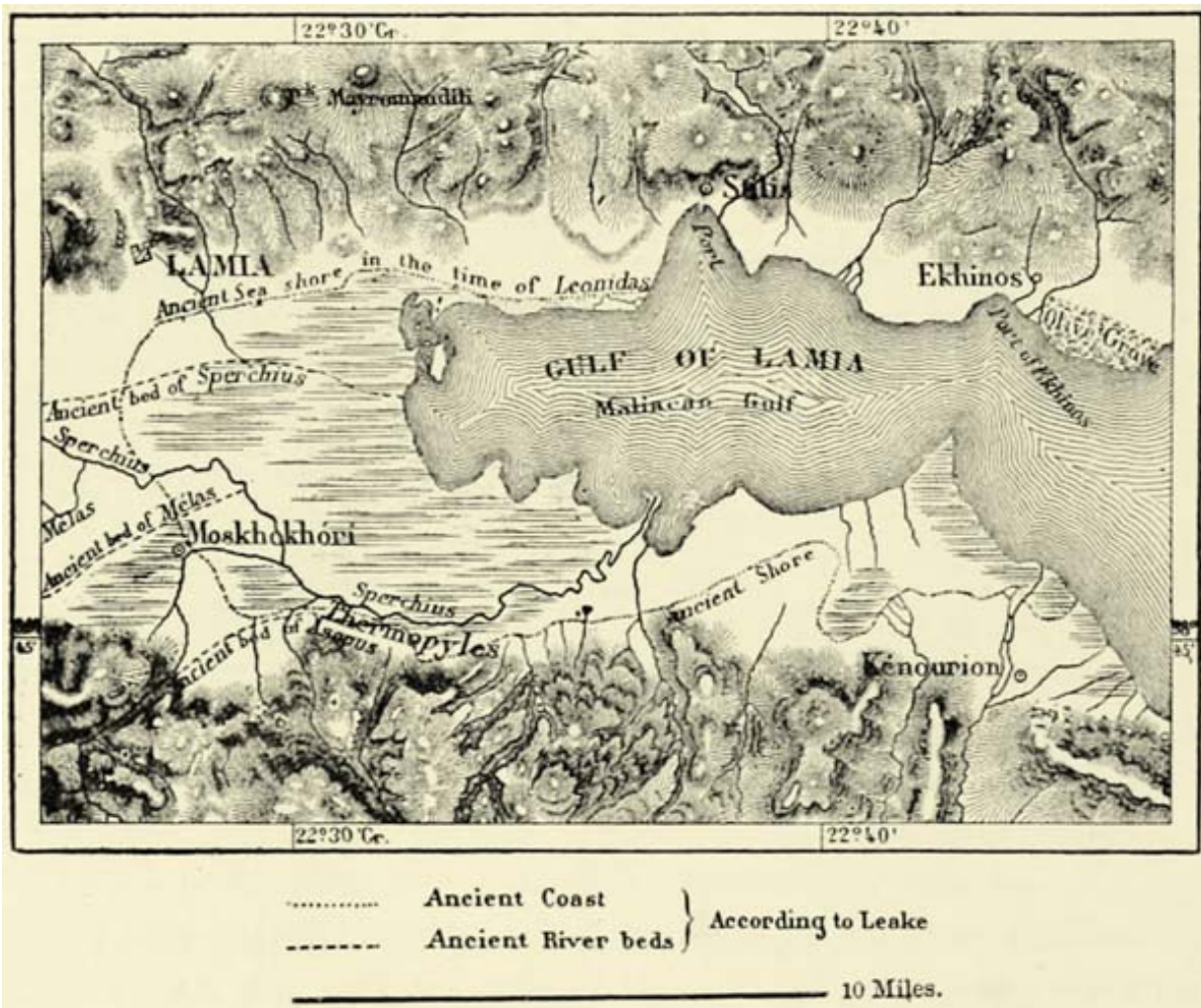


Another lake basin lies to the south of the Zygus, between the alluvial lands of the Achelous and the Fidari. It is occupied by a swamp filled with fresh, brackish, or salt water; and since the days of ancient Greece, this swamp, owing to the apathy of the inhabitants, has continued to increase in extent at the expense of the cultivated land. Missolonghi the heroic is indebted for its name to its position near these marshes, for the meaning of it is "centre of marshes." A barrier, or *ramma*, here and there broken through by the floods, separates the basin of Missolonghi from the Ionian Sea. During the war of independence every opening in this barrier was protected by redoubts or stockades, but at present the only obstruction consists of the reed barriers of the fishermen, which are opened in spring to admit the fish from the sea, and closed in summer to prevent their escape. Missolonghi, though surrounded by brackish water, is a healthy place, thanks to the breezes from the

sea; whilst a heavy atmosphere charged with miasmata hangs perpetually over the bustling little town of Ætoliko (Anatolikon), which lies farther to the north-west in the midst of the swamps, and is joined to the dry land by two bridges. Between Ætoliko and the river Achelous may be observed a large number of rocky eminences, rising like pyramids above the plain. These are no doubt ancient islands, such as still exist between the mainland and the island of St. Mauro. The mud brought down by the Achelous has gradually converted the intervals between these {50} rocks into dry land. In former times the commercial city of Cœniadæ occupied one of these islets. The geological changes already noticed by Herodotus are thus still going on under our eyes, and the muds of the Achelous, to which it owes its modern name of Aspro, or "white," incessantly extend the land at the expense of the sea.

Fig. 13.—THERMOPYLÆ.
From the French Staff Map (1852). Scale 1 : 330,000.

[M](#)



The Achelous, which the ancients likened to a savage bull, owing to its rapid current and great volume, is by far the most important river of Greece. One of the great feats ascribed to Hercules consisted in breaking off one of the horns of this bull; that is to say, he embanked the river, and thus protected the lands which it used to inundate. The neighbours of the Achelous, the rapid Fidari (Evenus, on the banks of which Hercules killed the centaur Nessus, for offering violence to Dejanira) and the Mornos, which rises in the snows of the Cēta, cannot compare with it. Still less is it equalled by the Oropus, the Cephissus, and the Ilissus, "wet only when it rains," which flow eastward into the Ægean Sea. The principal river of

Eastern Greece, the Sperchius, is inferior to the Achelous, but, like it, has extensively changed the aspect of the plain near its mouth. When Leonidas and his three hundred heroes guarded the defiles of Thermopylæ against the Persians, the Gulf of Lamia extended much farther into the land than it does now. But the alluvial deposits of the river have extended its delta, and several rivulets which formerly flowed {51} directly into the sea have now to be numbered amongst its tributaries; the sea has retired from the foot of the Callidromus for a distance of several miles; and the narrow pass of Thermopylæ has been converted into a plain sufficiently wide to enable an entire army to manœuvre upon it. The hot springs which gush from the rocks, by forming deposits of calcareous tufa, may likewise have contributed towards this change of coast-line; nor are more violent convulsions of nature precluded in a volcanic region like this, subject to frequent earthquakes. Sailors still point out a small island in this neighbourhood, formed of scorizæ, from which the incensed Hercules hurled his companion, Lichas, into the ocean. Hot springs abound on the opposite coast of Eubœa, and the incrustations formed by them are so considerable as to assume the appearance of glaciers when seen from a distance. A bathing establishment exists now near the hot sulphur springs of Thermopylæ, and strangers are thus enabled to explore this region, so rich in memories of a great past. The pedestal, however, upon which reposed the figure of a marble lion, placed there in honour of Leonidas, has been destroyed by ruthless hands, and utilised in the construction of a mill !

The basin of the Cephissus, enclosed by the chains of the Cæta and Parnassus, is one of the most remarkable from an hydrological point of view. The river first flows through a bottom-land formerly a lake, and then, forcing for itself a passage through a narrow defile commanded by the spurs of Mount Parnassus, it winds round the rock upon which stood the ancient city of Orchomenus, and enters upon a vast plain, where swamps and lakes are embedded amidst cultivated fields and reed-banks. These swamps are fed, likewise, by

numerous torrents descending from the Helicon and other mountains in its vicinity. One of these is the torrent of Livadia, into which the bounteous springs of Memory and Oblivion—Mnemosyne and Lethe—discharge themselves. In summer a large portion of the plain is dry, and it yields a bountiful harvest of maize, the stalks of which are sweet like sugar-cane. But after the heavy rains of autumn and winter the waters rise twenty, and even twenty-five feet, and the plain is converted into a vast lake, ninety-six square miles in extent. The myth of the deluge of Ogyges almost leads us to believe that the rising floods occasionally invaded every valley which debouches into this basin. To the ancients the shallower part of this lake was known as Cephissus, and its deep eastern portion as Copais, from Copæ, a town occupying a promontory on its northern shore, and now called Topolias.

Fig. 14.—LAKE COPAIS
From the French Staff Map. Scale 1 : 500,000.

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The importance of regulating the floods just referred to, and of preventing the sudden overflow of the waters to the destruction of the cultivated fields, may readily be imagined. The ancient Greeks made an effort to accomplish this task. To the east of the large Lake of Copais there is another lake basin, about one hundred and thirty feet lower, and encompassed by precipitous rocks, incapable of cultivation. This basin, the Hylice of the Boeotians, appears to be made by nature for receiving the superabundant waters of the Copais. The remains of a canal may still be traced in the plain, which was evidently intended to convey into {52} it the floods of the Copais, but it appears never to have been completed. No doubt care was taken to keep open the various *katavothras*, or subterranean channels, through which the waters of the Copaic lake discharge themselves into the sea. One of these, on the north-western shore of the lake, and close to the rock of Orchomenus, swallowed up the river Melas, and conveyed its waters to the Gulf of Atalanta. Farther to the east other subterranean channels flow towards Lakes Hylice and Paralimni, but the most important of these channels are towards the north-east, in the Gulf of Kokkino. In that extreme angle of the lake, the veritable Copais, the waters of the Cephissus rush against the foot of Mount Skroponeri, and are swallowed up by the ground so as to form a subterranean delta. To the south there is a cavernous opening in the rock, but this is merely a sort of tunnel passing underneath a promontory, and, except during the rainy season, it may be traversed dry-shod. Beyond this, another opening swallows up one of the most important branches of the Cephissus, which makes its reappearance in the shape of bounteous springs pouring their waters into the sea. Two other branches of the river disappear in the rocks about a mile farther north. They join soon afterwards, and flow northwards beneath the bottom of a sinuous valley. The old Greek engineers dug pits in this valley, which enabled them to descend to the subterranean waters, and to clear away obstructions interfering with their flow. Sixteen of these pits have

been discovered between the opening of the katavothra and the place where the waters reappear. Some of these are still thirty to one hundred feet in depth; but most of them have become choked up with stones and earth. These ancient engineering works, which Crates vainly endeavoured to restore in the time of Alexander, may possibly date {53} from the mythical age of King Minyas of Orchomenus,¹⁵ and the successful draining of these marshes may account for the well-filled treasury of that king spoken of by Homer. Thus the ingenuity of the Homeric age had succeeded in accomplishing a work of the engineering art which baffles our modern men of science!



PEASANTS FROM THE ENVIRONS OF ATHENS.

The whole of Western Greece, filled as it is by the mountains of Acarnania, Ætolia, and Phocis, is condemned by nature to play a very subordinate part to the eastern provinces. In the time of the ancient Greeks these provinces were looked upon almost as a

portion of the world of the barbarians, and even in our own days the Ætolians are the least cultivated of all the Greeks. There is no commerce except at a few privileged places close to the sea, such as Missolonghi, Ætoliko, Salona, and Galaxidi. The latter, which is situated on a bay, into which flows the Pleistus, a river at one time consecrated to Neptune, although quite dry during the greater part of the year, was, up to the war of independence, the busiest seaport on the Gulf of Corinth. As for Naupactus, or Epakto, (called Lepanto by the Italians), it was important merely from a strategical point of view, on account of its position at the entrance of the Gulf of Corinth, which is sometimes named after it. Many naval engagements were fought to force the entrance into the gulf, defended by the castles of Rumelia and Morea—the ancient Rhium and Antirrhium. A curious phenomenon has been observed in connection with the channel which forms the entrance to the Gulf of Corinth. Nowhere more than 36 fathoms in depth, it is subject to perpetual changes in its width, owing to the formation of alluvial deposits by maritime currents. What one current deposits is carried away by the other. At the epoch of the Peloponnesian war this channel was 7 stadia, or about 1,200 yards, wide; at the time of Strabo its width was only 5 stadia; whilst in our own days it is no less than 2,200 yards from promontory to promontory. The entrance of the Gulf of Arta, between the Turkish Epirus and Greek Acarnania, does not present the same phenomena, and its present width is about equal to that assigned to it by every ancient author; that is to say, about 1,000 yards.

The valleys and lake basins of Eastern Greece, and more especially its position between the Gulf of Corinth, the Ægean Sea, and the channel of Eubœa, which almost convert it into a peninsula, sufficiently account for the prosperity of that country. With its cities of Thebes, Athens, and Megara, it is essentially a land of historical reminiscences. The contrast between the two most important districts of this region—Bœotia and Attica—is very striking. The first

of these is an inland basin, the waters of which are collected into lakes, where mists accumulate, and a rich vegetation springs forth from a fat alluvial soil. Attica, on the other hand, is arid. A thin layer of mould covers the terraces of its rocky slopes; its valleys open out into the sea; the summits of its mountains rise into an azure sky; and the blue waters of the Ægean wash their base. Had the Greeks been fearful of the sea; had they confined themselves, as in the earliest {54} ages, to the cultivation of the soil, Bœotia, no doubt, would have retained the preponderance which it enjoyed in the time of the Minyæ of wealthy Orchomenus. But the progress of navigation and the allurements of commerce, which proved irresistible to the Greeks, were bound by degrees to transfer the lead to the men of Attica. The city of Athens, which arose in the midst of the largest plain of this peninsula, therefore occupied a position which assured to it a grand future.

Fig. 15.—THE ACROPOLIS OF ATHENS.

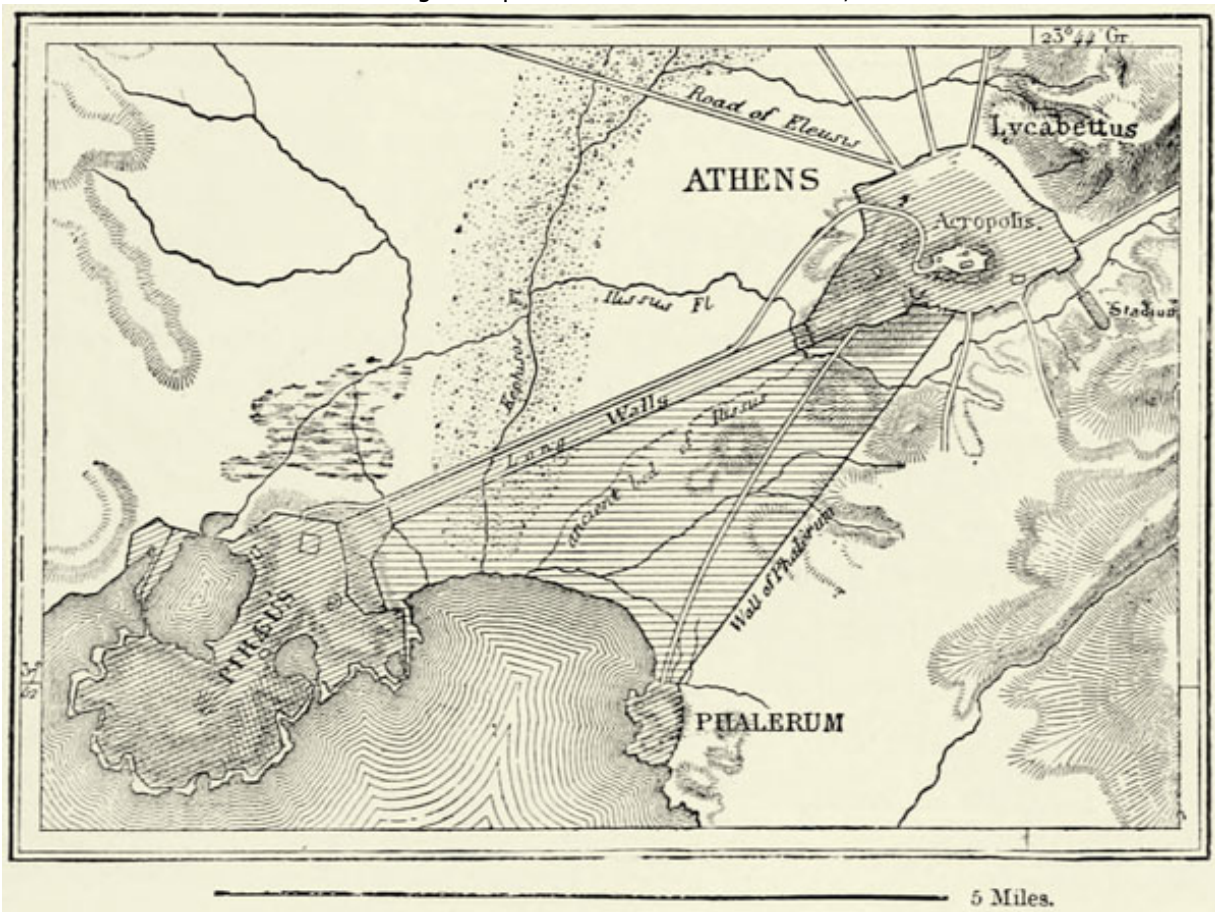


The choice of Athens as the modern capital of Greece has been much criticized. Times have changed, no doubt, and the natural centres of commerce have become shifted, in consequence of the migrations of nations. Corinth, on the isthmus joining continental Greece to the Peloponnesus, and commanding two seas, undoubtedly deserved the preference. Its facilities for communicating with Constantinople and the Greek maritime districts still under the rule of the Osmanli, on the one hand, and with the western world, from which now proceed all civilising impulses, on the other, are certainly greater than those of Athens. If Greece, instead of a small centralised kingdom, had become a federal republic, which would have been more in accordance with her genius and traditions, there is no doubt that other towns of Greece, more

favourably situated than Athens for establishing rapid communications with the rest of Europe, would soon have surpassed that town in population and commercial wealth. Athens, however, has grown upon its plain, and, by the construction of a railway, it has become even {55} a maritime city, as in ancient days, when its triple walls joined it to the ports of the Piræus and Phalerum.

Fig. 16.—ATHENS AND ITS LONG WALLS.
According to Kiepert and Schmidt. Scale 1 : 114,000.

[M](#)



But how great the difference between the monuments of the ancient city and of the modern! The Parthenon, though gutted by the shells of the Venetian Morosini, and robbed since of its finest sculptures, still retains its pure and simple beauty, which agrees so well with the sobriety of the surrounding landscape—still remains the finest architectural work of the world. By the side of this majestic

ruin, on the same plateau of the Acropolis, where the mariner in the Gulf of Ægina saw the gilt spear-head of Athene Promachos glitter in the sun, there rise other monuments, the Erechtheum and the Propylæa, hardly inferior to it, and dating likewise from the great period of art. Outside the city, on a promontory, rises the temple of Theseus, the best-preserved monument of Greek antiquity. Elsewhere, on the banks of the Ilissus, a group of columns marks the site of the magnificent temple of Olympian Jupiter, which it took the Athenians seven hundred years to build, and which their degenerate descendants made use of as a quarry. Remarkable remains have been discovered in many other parts of the ancient city, and the least of them are of interest, for they recall the memory of illustrious men. On such a rock sat the Areopagus which condemned Socrates; from this stone tribune Demosthenes addressed the multitude; and here walked Plato with his disciples!

A similar historical interest attaches to nearly every part of Attica, whether we visit the city of Eleusis, where the mysteries of Ceres were celebrated, or the {56} city of Megara, with its double Acropolis, or whether we explore the field of Marathon and the shores of the island of Salamis. Even beyond Attica the memories of the past attract the traveller to Plataea, to Leuctra, Chæronea, Thebes of Œdipus, and Orchomenus of Minyas, though, in comparison with what these districts were in other times, they are now deserts. In addition to Athens and Thebes, there are now only two cities in eastern continental Greece which are of any importance. These are Lamia, in the midst of the low plains of the Sperchius, and Livadia, in Bœotia, at one time celebrated for the cavern of Trophonius, which archæologists have not yet succeeded in identifying. The island of Ægina, which belongs to Attica, offers the same spectacle of decay and depopulation as the mainland. Anciently it supported more than two hundred thousand inhabitants; at present it hardly numbers six thousand. But the island still retains the picturesque ruin of its

temple of Minerva, and the prospect which it affords of the amphitheatre of hills in Argolis and Attica is as magnificent as ever.

Fig. 17.—ANCIENT ATHENS.
According to Kiepert and Schmidt. Scale 1 : 30,000.

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III.—THE MOREA, OR PELOPONNESUS.

Geographically the Peloponnesus well deserves the name of island, which was bestowed upon it by the ancients. The low Isthmus of Corinth completely severs it from the mountainous peninsula of Greece. It is a world in itself, small enough as far as the mere space is concerned which it occupies upon the map, but great on account of the part it has played in the history of humanity. {57}

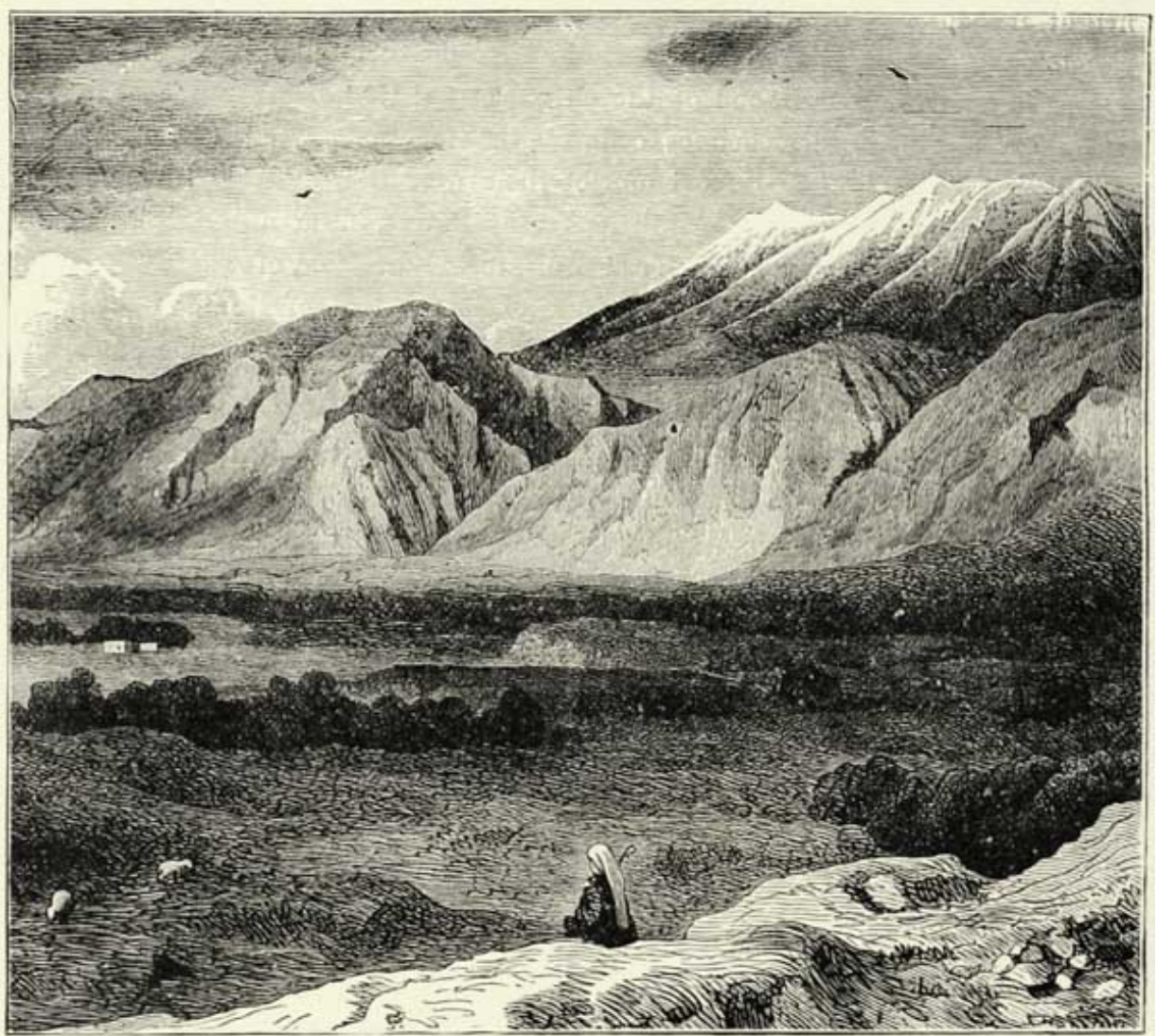
On entering the Peloponnesus from the Isthmus of Corinth, we see rising in front of us the mountain rampart of Oneium, which defended the entrance of the peninsula, and upon one of whose promontories was built the nearly impregnable citadel of Corinth. These mountains form part of the general mountain system of the whole island, and, sheltered by them, its inhabitants could live in security. The principal mountain mass, whence all other chains radiate towards the entrances of the peninsula, is situated in the interior of the country, about forty miles to the west of Corinth. There Mount Cyllene of the ancient Greeks, or Zyria, rises into the air, its flanks covered with dark pines; and farther away still, the Khelmos, or Aroanian Mountain, attains even a more considerable height, its snows descending into a valley on its northern slope, where they give rise to the river Styx, the cold waters of which prove fatal to perjurers, and disappear in a narrow chasm, one of the entrances to Hades. A range of wooded peaks, to the west of the Khelmos, connects that mountain with the Olonos (Mount Erymanthus), celebrated as the haunt of the savage boar destroyed by Hercules. All those mountains, from Corinth as far as Patras, form a rampart running parallel with the southern shore of the gulf, in the direction of which they throw off spurs enclosing steep valleys. In one of these—that of Buraikos—we meet with the grand caverns of Mega-Spileon, which are used as a monastery, and where the most curious structures may be seen built up on every vantage-ground

offered by the rocks, suggesting a resemblance to the cells of a vast nest of hornets.

The table-land of the Peloponnesus is thus bounded towards the north by an elevated coast range. Another chain of the same kind bounds it on the east. It likewise starts from Mount Cyllene, and extends southward, its various portions being known as Gaurias, Malevo (Mount Artemisium), and Parthenion. It is then broken through by a vast depression, but again rises farther south as the range of Hagios Petros, or Parnon, to the east of Sparta. Getting lower by degrees, it terminates in the promontory of Malea, opposite to the island of Cerigo. It was this cape, tradition tells us, which formed the last refuge of the Centaurs; that is to say, of the barbarian ancestors of the modern Tsakonians. No promontory was more dreaded by Greek navigators than this Cape Malea, owing to sudden gusts of wind, and an ancient proverb says, "When thou hast doubled the cape forget the name of thy native land."

The mountains of Western Morea do not present the regularity of the eastern chain. They are cut through by rivers, and to the south of the Aroanian Mountains and the Erymanthus they ramify into a multitude of minor chains, which now and then combine into mountain groups, and impart the most varied aspect to that portion of the plateau. Everywhere in the valleys we come unexpectedly upon landscapes to which an indescribable charm is imparted by a group of trees, a spring, a flock of sheep, or a shepherd sitting upon a heap of ruins. We are in beautiful Arcadia, sung by the poets. Though in great part deprived of its woods, it is still a beautiful country; but more charming still are the eastern slopes of the plateau, which descend towards the Ionian Sea. There luxuriant forests and {58} sparkling rivulets add an element of beauty to blue waves, distant islands, and a transparent sky, which is wanting in nearly every other part of maritime Greece.

Fig. 18.—MOUNT TAYGETUS.



The table-land of Arcadia is commanded on the west by pine-clad Mænalus, and bounded on the south by several mountain groups which give birth to separate mountain chains. One of these mountain masses—the Kotylion, or Palæocastro—thus gives rise to the mountains of Messenia, amongst which rises the famous Ithome, and to those of Ægaleus, which spread over the peninsula to the west of the Gulf of Coron, and reappear in the sea as the rocky islets of Sapienza, Cabrera, and Venetikon. Another mountain mass, the Lycæus, or Diaforti—the Arcadian Olympus, which the Pelasgians

claim for their cradle—and which rises almost in the centre of the Peloponnesus, is continued westward of Laconia by an extended mountain chain, the most elevated and most characteristic of all the Morea. The highest crest of these mountains is the famous Taygetus, known also as Pentedactylum (five fingers), because of the five peaks which surmount it; or as St. Elias, in honour, no doubt, of Helios, the Dorian sun-god. A portion of the lower slopes of this mountain is clothed with forests of chestnuts and walnuts. {59} interspersed with cypresses and oaks; but its crest is bare, and snow remains upon it during three-fourths of the year. The snows of Taygetus direct the distant mariner to the shores of Greece. On approaching the coast, he sees rising above the blue waters the spurs and outlying ridges of the Kakavuni, or “bad mountain.” Soon afterwards he comes in sight of the promontory of Tainaron, with its two capes of Matapan and Grasso—immense blocks of white marble more than six hundred feet in height, upon which the quails settle in millions after their fatiguing journey across the sea. Into the caverns at its foot the waters rush with a dull noise which the ancients mistook for the barking of Cerberus. Cape Matapan, like Malea, is dreaded amongst mariners as a great “destroyer of men.”

The three southern extremities of the Peloponnesus are thus occupied by high mountains and rocky declivities. The peninsula of Argolis, in the east, is likewise traversed by mountain ranges, which start from Mount Cyllene, similarly to the Gaurias and the mountains of Arcadia. The whole of the Peloponnesus is thus a country of table-lands and mountain ranges. If we except the plains of Elis, which have been formed by the alluvial deposits carried down by the rivers of Arcadia, and the lake basins of the interior, which have been filled up in the course of ages, we meet with nothing but mountains.¹⁶ The principal mountain masses—the Cyllene, the Taygetus, and Parnon—are composed of crystalline schists and metamorphic marbles, as in continental Greece. Strata of the Jurassic age and beds of cretaceous limestone are here and there met with at the

foot of these more ancient rocks. Near the coast, in Argolis, and on the flanks of the Taygetus, eruptions of serpentines and porphyries have taken place, whilst on the north-eastern coast of Argolis, and especially on the small peninsula of Methone, there exist recent volcanoes—amongst others, the Kaimenipetra, which M. Fouqué identifies with the fire-vomiting mouths of Strabo, and which had its last eruption twenty-one centuries ago. These volcanoes are, no doubt, the vents of a submarine area of disturbance which extends through Milos, Santorin, and Nisyros, to the south of the Ægean Sea.

The sulphur springs which abound on the western coast of the Peloponnesus are, perhaps, likewise evidences of a reaction of the interior of the earth.

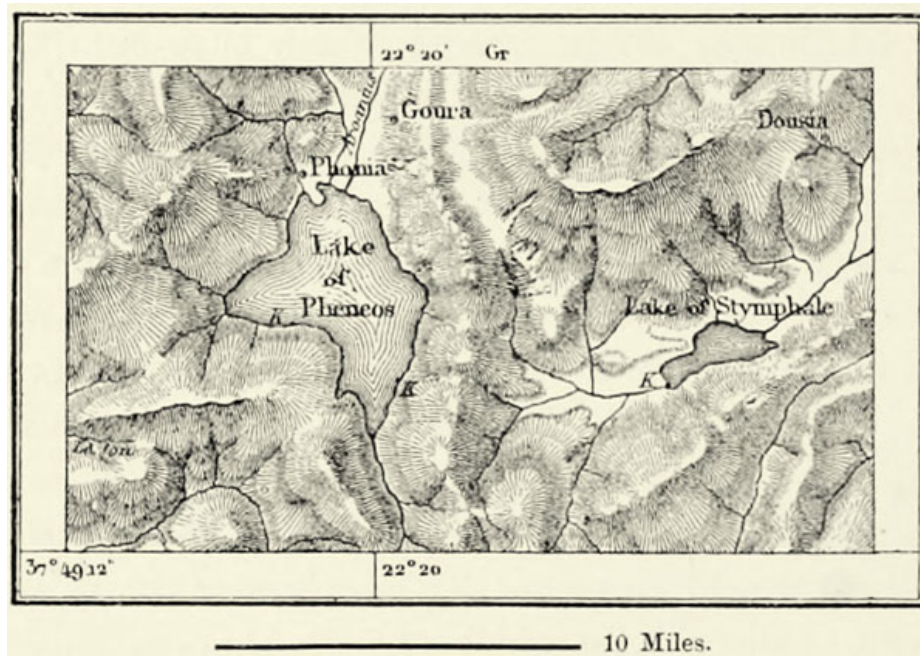
It is the opinion of several geologists that the coasts of Western Greece are being insensibly upheaved. In many places, and particularly at Corinth, we meet with ancient caverns and sea beaches at an elevation of several feet above the sea-level. It is this upheaval, and not merely the alluvial deposits brought down by rivers, which explains the encroachment of the land upon the sea at the mouth of the Achelous and on the coast of Elis, where four rocky islets have been joined to the land. Elsewhere a subsidence of the land has been noticed, as in the Gulf of {60} Marathonisi and on the eastern coast of Greece, where the ancient peninsula of Elaphonisi has been converted into an island. But even there the fluvial deposits have encroached upon the sea. The city of Calamata is twice as distant from the seashore now as in the days of Strabo, and the traces of the ancient haven of Helos, on the coast of Laconia, are now far inland.

The limestone rocks of the interior of the Peloponnesus abound as much in chasms, which swallow up the rivers, as do Bœotia and the western portion of the whole of the Balkan peninsula. Some of these katavothras are mere sieves, hidden beneath herbage and pebbles, but others are wide chasms and caverns, through which the course

of the underground waters may be readily traced. In winter wild birds post themselves at the entrances of these caverns, in expectation of the prey which the river is certain to carry towards them; in summer, after the waters have retired, foxes and jackals again take possession of their accustomed dens. The water swallowed up by these chasms on the plateau reappears on the other side of the mountains in the shape of springs, or *kephalaria* (*kephalovrysis*). The water of these springs has been purified by its passage through the earth, and its temperature is that of the soil. It bursts forth sometimes from a crevice in the rocks, sometimes in an alluvial plain, and sometimes even from the bottom of the sea. The subterranean geography of Greece is not yet sufficiently known to enable us to trace each of these kephalaria to the katavothras which feed them.

Fig. 19.—LAKES PHENEA AND STYMPHALUS.
From the French Staff Map. Scale 1 : 500,000.

[M](#)



The ancients were most careful in keeping open these natural funnels, for, by facilitating the passage of the water, they prevented the formation of swamps. These precautions, however, were

neglected during the centuries of barbarism which overcame Greece, and the waters were permitted to accumulate in many places at the expense of the salubrity of the country. The plain of Pheneus, or Phonia, a vast chasm between the Aroanian Mountains and the Cyllene, has thus repeatedly been converted into a lake. In the middle of last century the whole of this basin {61} was filled with water to a depth of more than 300 feet. In 1828, when this sheet of water had already become considerably reduced, it was still 6 miles long and 150 feet in depth. At length, a few years afterwards, the subterranean sluices opened, the waters disappeared, and there remained only two small marshes near the places of exit. But in 1850 the lake was again 200 feet in depth. Hercules, we are told, constructed a canal to drain this valley and to cleanse its subterranean outlets, but the inhabitants content themselves now with placing a grating above the "sink-holes," to prevent the admission of trunks of trees and of other large objects carried along by the floods.

To the east of the valley of Pheneus, and on the southern foot of Mount Cyllene, there is another lake basin, celebrated in antiquity because of the man-eating birds which infested it, until they were exterminated by Hercules. This is the Stymphalus, alternately lake and cultivated land. During winter the waters cover about one-third of the basin; but it happens occasionally, after heavy rains, that the lake resumes its ancient dimensions. There is only one katavothra through which the waters can escape, and this, instead of being near the shore, as usual, is at the bottom of the lake. It swallows up not only the water of the lake, but likewise the vegetable remains carried into it, and the mud formed at its bottom; and this detritus is conveyed through it to some subterranean cavity, where it putrefies slowly, as may be judged from the fetid exhalations proceeding from the katavothra. The water, however, is purified, and when it reappears on the surface, close to the seashore, it is as clear as crystal.

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